CHAPTER 3

Working With HEC-FDA - An Overview

Overview

HEC-FDA is an inter disciplinary program used to formulate and evaluate flood damage reduction plans. You interact with HEC-FDA through a Graphical User Interface (GUI). The program performs economic (flood inundation damage analysis) and hydrologic engineering performance computations for plan evaluations.

In HEC-FDA terminology, a **Study** is a set of data files associated with a planning evaluation. The **Study** includes all streams and damage reaches to be analyzed as part of the study area. You can perform any or all of the analyses available in the HEC-FDA program as part of the study. Only one study is open at a time. The files associated with the study contain information on plans, analysis years, streams, damage reaches, damage categories, structures, etc. The files are stored together in one directory as xBASE formatted database files. The directory is named when a new study is created. The directory is a subdirectory of the HEC-FDA directory (c:\hec\fda).

During the course of a study, you may formulate and evaluate several different **Plans**. The first plan is always the without-project condition. Additional plans may contain levees, reservoirs, channels, nonstructural measures, and other measures or combinations thereof. You can easily formulate new plans once the basic data are entered. The results can be compared after the analysis of various plans are performed.

This chapter provides an overview of how a study is performed with the HEC-FDA. Special topics on importing data and how to use on-line help are also covered.

Contents

Starting HEC-FDA

You create a new program group and icon for HEC-FDA in Windows when you run the HEC-FDA Setup Program. The icon should appear as shown in Figure 3.1.

Figure 3.1 The HEC-FDA Icon in Windows

To Start HEC-FDA from Windows:

Double-click on the HEC-FDA Icon in the HEC program group.

When you first start HEC-FDA, you will see the main window as shown in Figure 3.2.

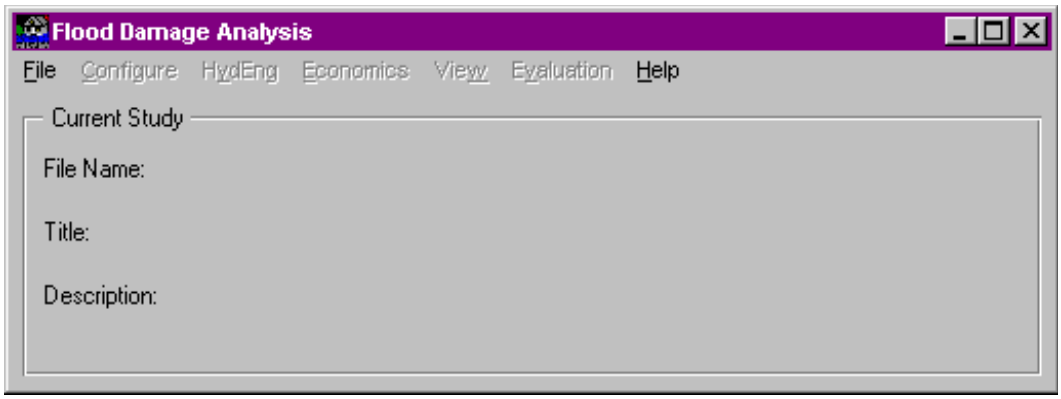

Figure 3.2 The HEC-FDA Main Window

General Layout

The HEC-FDA main window has the following items on the menu bar.

File—This item is used for file management. The following are options available under the File menu: New Study, Open Study, Delete Study, Normalize Export, Merge, Study Info, and Exit.
Configure—This item is used to enter information about the study

configuration. Data are needed for the following areas: Streams, Damage Reaches, Analysis Years, and Plans. Two reports are available, Study Data Management and Study Status.

HydEng—You enter data needed for hydrologic and hydraulic analyses under this menu item. The data entry option includes Water Surface Profiles, Exceedance-Probability Function with Uncertainty, Stage-Discharge Functions with Uncertainty, and Levee Features.

Economics—You enter data needed for economic analyses under this menu item. Data entry options include Damage Categories, Structure Occupancy Types, Structure Modules and Module Assignments, Structure Inventory, and Define Stage-Damage with Uncertainty or Compute Stage-Damage with Uncertainty. You can also Import existing HEC-SID and ASCII text files.

Evaluation—You compute and evaluate economic and engineering performance under this menu item. The computation are performed by plans and analysis year or by plan equivalent annual damage. Hydrologic engineering project performance by plans are also computed. Output reports and selected plots are available for viewing results and comparison plans.

Help—This menu item allows you to get on-line help, as well as display the current version information about HEC-FDA.

Analysis Steps

These steps are used in formulating and evaluating plans with HEC-FDA:

- Define a study **(File Menu)**. This is a team effort.

- Enter study configuration data **(Configure Menu)**. This is a team effort.

- Enter hydrology and hydraulics data **(HydEng Menu)**. Performed by the hydrologic and hydraulics team members, normally concurrent with the economics analyses.

- Enter economics data and/or compute aggregated stage-damage functions **(Economics Menu).** Performed by the economics team members, normally concurrent with the hydrology and hydraulics analyses.

- Perform the expected annual damage/equivalent annual damage calculations **(Evaluation Menu)**. Normally performed and reviewed by the study team.

Define a Study

File—You define a new study or open an existing study under the **File** menu item. Once a study is opened, the filename, title, and description of the study will always appear on the main window. Figure 3.3 shows the available options under the file menu.

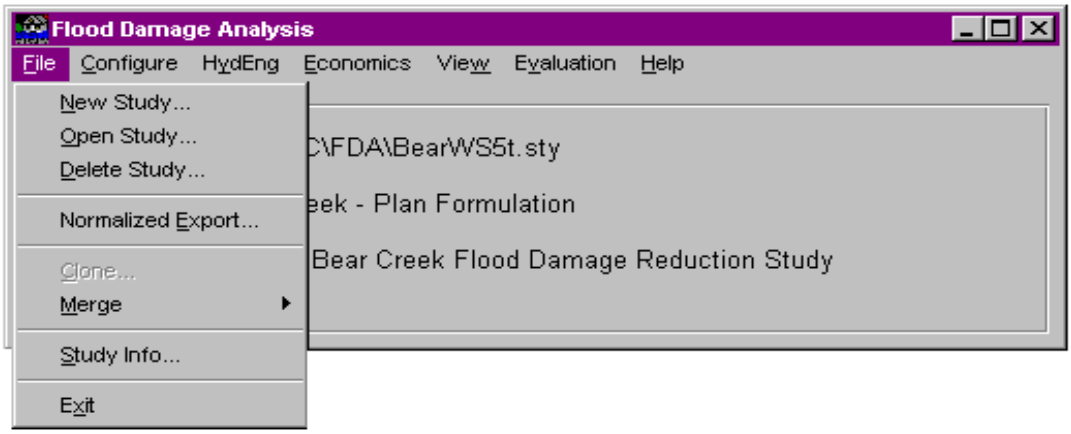

Figure 3.3 Main Window, File Menu Item

New Study-To define a new study, go to the **File** menu on the main HEC-FDA window and select **New Study**. This brings up a New Study window as shown in Figure 3.4. The **New Study** dialog appears with the default study filename extension (*.sty), directories and drive (c:\hec\fda). You can put the study anywhere on the hard disk. However, we recommend the study be a subdirectory of the program directory. The study filename extension can not be changed. Once the filename is entered, a new directory is created with that name. All database files are then created. After the study information is entered, press the OK button to bring up the Study Information screen window shown in Figure 3.5.

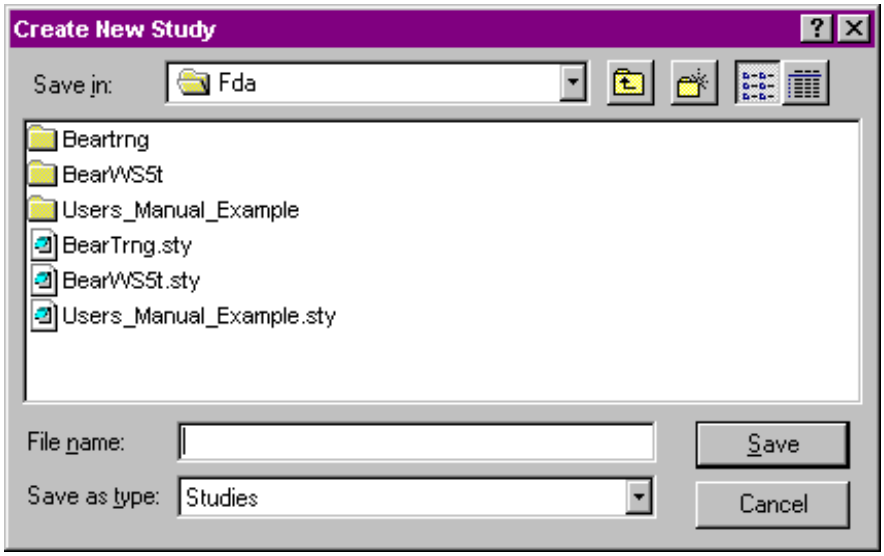

Figure 3.4 New Study Window

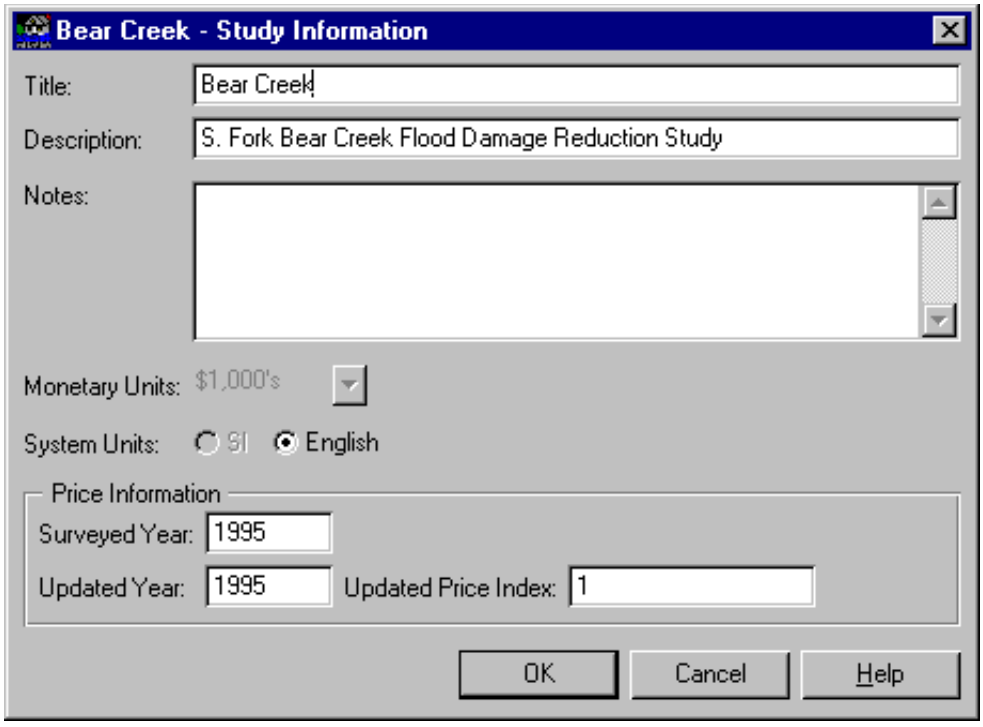

Figure 3.5 Study Information Window

Study Information—Under the **Study Information** screen, you provide information about the study including: a title; a description; notes about the study; and price index information. The information is used on various windows and reports throughout the program.

You choose the numeric monetary units to be used for all study data entry and output reports. You may specify only $, $1000's, or $1,000,000's. For example, $1000's (the default) indicates all values will be in $1000's. These are used as labels only. System Units is a flag indicating that all units for the study data entry and output reports will be either SI (metric) or English. These are also used as labels only. No conversions are made in the program. Once defined, the monetary and System Units can not be changed for the study.

NOTE: Once the Monetary and System Units are defined and you leave the Study Information dialog, they cannot be changed. The other information may be changed at a later time.

The price indices allow you to globally adjust the price data from the year the damage survey data was compiled to an updated year. The values may be modified for unique damage categories under **Economics/Damage Categories**. The surveyed year is the year associated with the original structure inventory survey flood damage values. It must be a numeric four digit value greater than 1900. It is used as a label only. The updated year is the price year associated with an updated price index. It is also a numeric four digit value. It must be greater than or equal to the surveyed year (default is surveyed year). The updated price index is used to update all economic (structure damage) values to present (or other) values. It can be any numeric value between 0.00 and 100.00. If blank, it is assumed to be the same index value as the surveyed year with no adjustments made to the economic data.

Open Study—To open an existing study you select **Open Study**. A screen similar to the **New Study** screen will appear. A list of previously defined studies will appear on the screen. You double click on the study name to retrieve the current study dialog containing the appropriate study information. You may select the **Study Info** from the **File** menu to update the information as shown in Figure 3.5.

Delete Study—Deletes the currently opened study. It deletes all files stored under the ".sty" file and subdirectory in the study name.

Normalized Export—A procedure which converts data stored in the database memo fields to database tables. This enables the data to be viewed and manipulated with other commercial databases or spreadsheets. A subdirectory is created under the study folder.

Merge—The **Merge** option allows you to make copies of the database (base copy), enter/edit data on the copies (incoming copy), and merge the results from the incoming copy back to the base copy. It's designed for the various hydrologic engineering and economics disciplines of the study team to work in parallel on separate work stations and to then merge the data together for analyses. It ensures that the resulting merged database does not have any inconsistencies or redundant data. There are different rules for the two types of merge - **Hydrologic Engineering** and **Economics**.

HINT: We strongly recommend that you backup your study prior to performing the merge operation.

The first step in **Merge** is to make a copy of the study .sty file (i.e., BearTrng.sty) and the directory (i.e., BearTrng) which contains the database files. The name that is given to the .sty file must be the same name given to the directory (i.e., xxx.sty and xxx), and both must be in the same parent directory. Copying the study files is performed outside the HEC-FDA package using the Windows File Manager or other utilities. The process is:

- Create a new directory (xxx), which will store the incoming copy.
- Copy the entire contents of the base copy (BearTrng) into the directory "xxx".
- Copy the base copy's study file (BearTrng.sty) to xxx.sty.

Copies may be made to floppy diskettes or an other medium for different study disciplines to use. We recommend that the incoming copy (xxx) be copied to the hard disk when using the study.

Changes to the configuration files (items under the **Configuration Menu**) of the incoming copy (xxx) are not allowed and will fail the merge. Only the base copy (BearTrng) can have changes to the configuration files. These changes may be additions only. If deletions are made to the base copy (BearTrng), then the merge will fail.

Changes to hydrology/hydraulics (**HydEng**) data can only be made to the incoming copy (xxx). If changes are made to the base copy (BearTrng) and a **Hydrology Merge** is done, the changes to the base copy (BearTrng) will be lost.

The **Economic Merge** works only with structure information, i.e., the structure occupancy type (depth-percent damage functions), structure inventory, and direct depth-dollar damage functions. Additions can be made to both the base (BearTrng) and the incoming (xxx) copies. If the name of a data item is the same for the base (BearTrng) copy and the incoming (xxx) copy, the latter is ignored. Editing should be done to the base (BearTrng) copy. When an **Economics Merge** is done, the Stage-Damage functions **are cleared** from the

base (BearTrng) copy.

Damage categories are considered a configuration item for **Merge** and changes should only be made to the base (BearTrng) copy.

Study Configuration

Configure is where you configure the physical study layout and define plans for analysis for the study. The data defined are in common with all analyses. You define the study streams, damage reaches, plans, analysis years as shown in Figure 3.6.

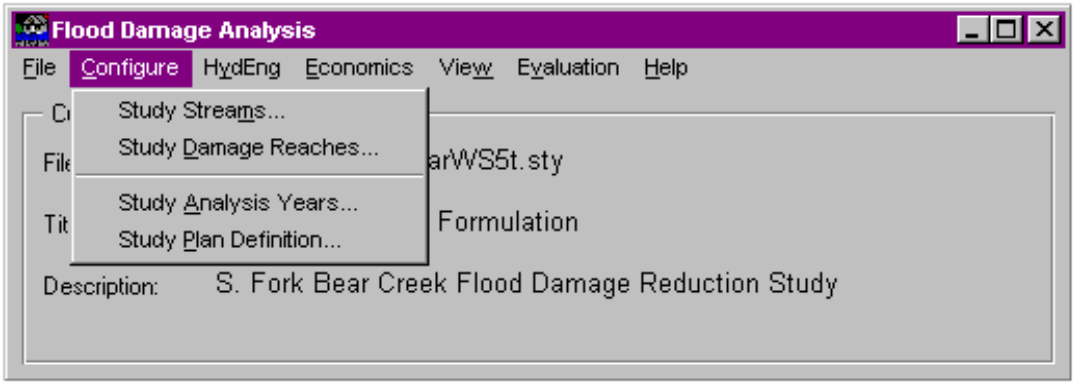

Figure 3.6 Main Window, Configuration Menu Items

When performing a study, it is important that all study members agree on the study configuration. Hydrologic engineers, economists, and study managers must work together to develop the configuration. The study configuration consists of those data items that are not likely to change during a study. See Chapter 4 for a more detailed description.

Hydrologic Engineering

Hydrologic Engineering (HydEng) is where you define the hydraulics and hydrology data needed to evaluated plans project conditions plans (see Figure 3.7). You can specify sets of water surface profiles by stream for each plan and the analysis year to be analyzed. Exceedance probability functions, stage-discharge functions, and levee features are also defined under **HydEng**. See Chapter 5 for more detailed information.

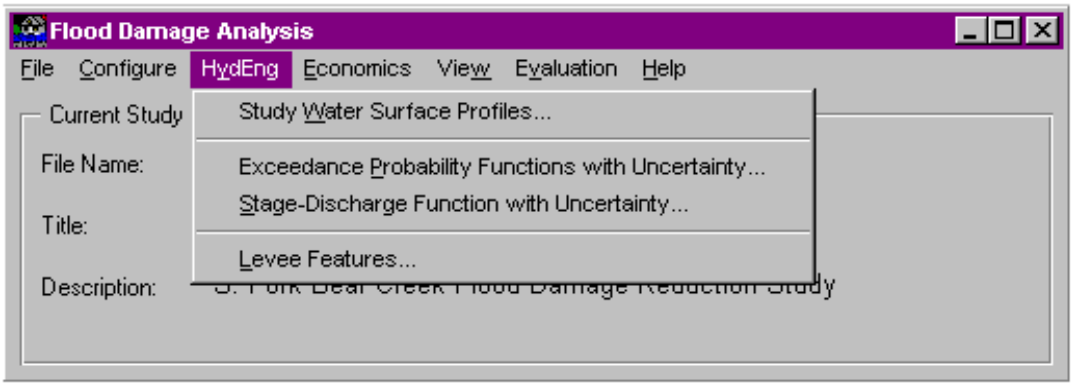

Figure 3.7 Main Window, Hydrologic Engineering Menu Items

Economics

Economics (see Figure 3.8) is where you define the economic data needed to evaluate the defined plans. The data includes: damage categories; structure occupancy types; structure inventory data, and stage-damage functions. Damage categories and structure occupancy types are defined for the entire study. You may enter the stage-damage functions with uncertainty directly by Plan, Year, Damage Reach, and Damage Category or you may compute the aggregated values based on the structure inventory data, water surface profiles, and uncertainty specifications. Please see Chapter 6 for more detailed descriptions.

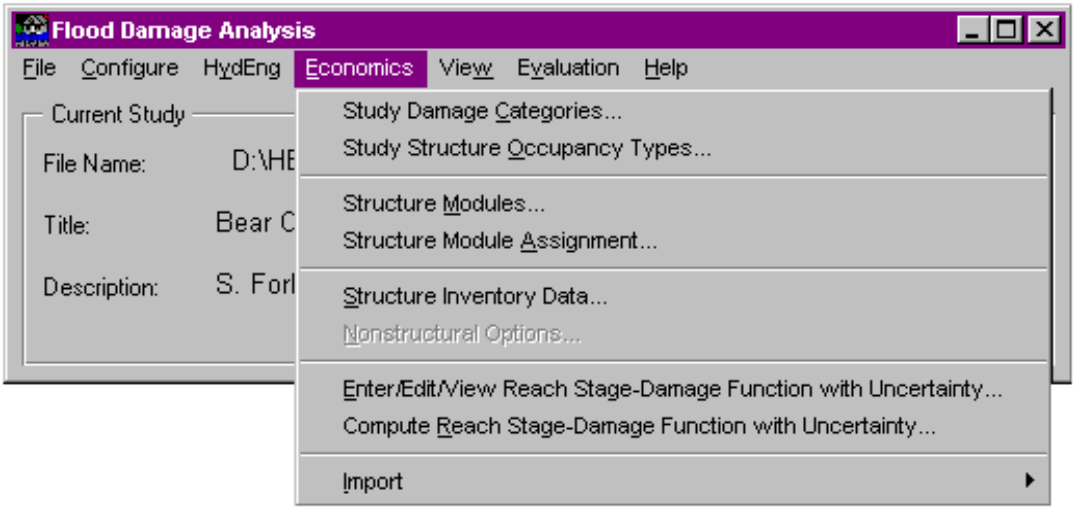

Figure 3.8 Main Window, Economics Menu Items

Evaluation

Evaluation is where you compute results for economics and performance by analysis years and equivalent annual damage using the risk-based analysis approach. An example screen for computations of expected annual damage by analysis years is shown in Figure 3.9. Further information about Evaluation is found in Chapter 7.

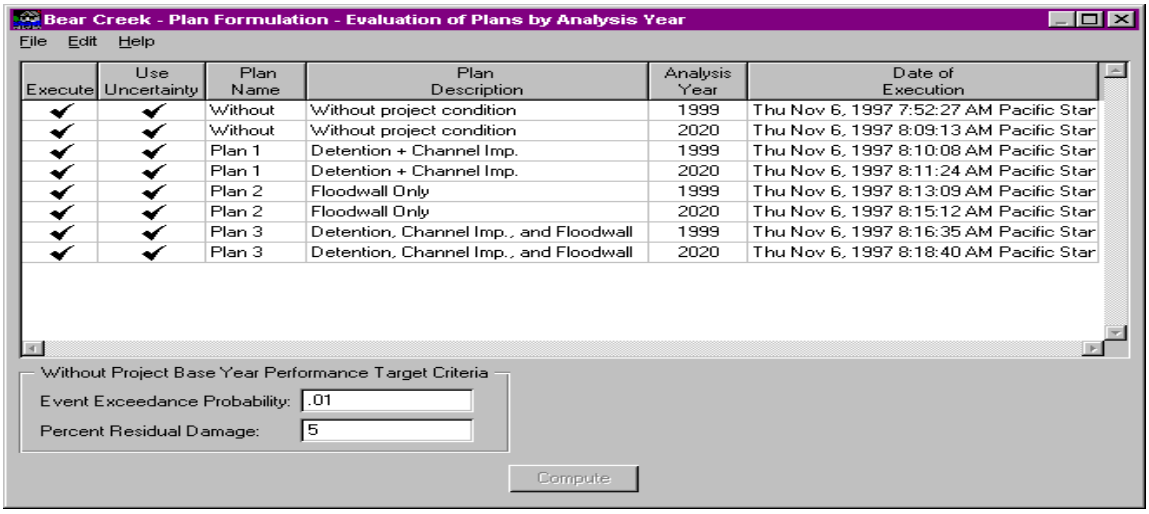

Figure 3.9 Expected Annual Damage Computation Screen

Viewing Results—A series of output reports are available once the computations are successfully completed. Options for viewing the computation results are shown on Figure 3.10. They include plans by analysis years, equivalent annual damage, and project performance. You may view the results of computational information summaries by specifying analysis reports by plans, years, streams, and damage reaches. More details are described in Chapter 8.

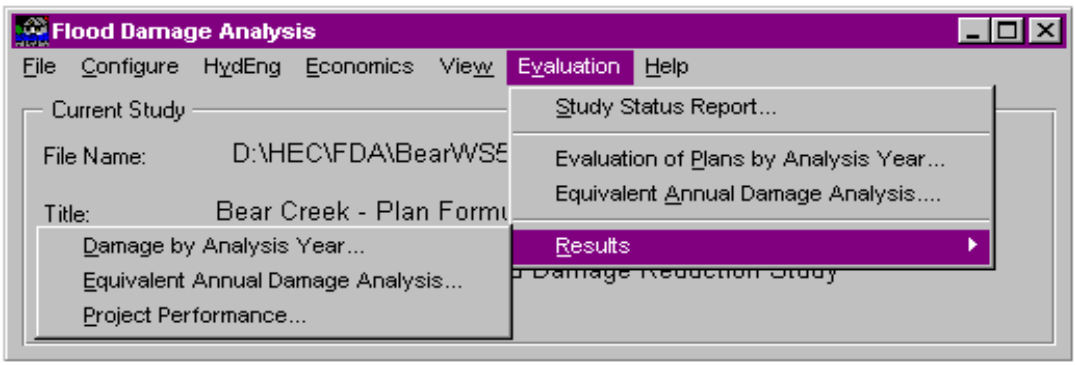

Figure 3.10 Main Window, Evaluation Menu Items

HEC-FDA Menu Items

The following is a composite of menu items found on HEC-FDA screens.

File Menu

- **Add/Update**-Saves new or edited data/information to the database.
- **Import**-You may retrieve specified information from an external file.
- **Close**-Closes the screen, if changes have not been saved, a warning message will appear. Clicking the **Cancel Button** gives you an opportunity to save the data. The **OK Button** closes the screen and any changes will be lost.

Edit Menu

- **Cut, Copy, Paste**-These function are the standard Windows cut/copy/paste functions.
- **First Record**-Places you at the first (top) record of the list.
- **Last Record**-Places you at the last (bottom) record of the list.
- **Previous Record**-Moves you to the previous (backward) record in the list.
- **New Record**-Insert a blank record into the list.
- **Delete Record**-Delete the selected record from the respective "function" list. A warning message will appear to ensure you wish to delete this record. Clicking on the **Yes Button** will delete the record, and the **No Button** will cancel the delete operation.
- **Global Assignment Copy**-Copy existing functions of one plan/year to another plan/year.

View Menu

- **List of Items**-A list of all the defined items (streams, damage reaches, plans, etc.) for the study is shown. List reports are

printed by selection of **Print** from the **File Menu** of the report screen.

- **Form or Table Entry**-You may select to enter data by using the form or key Table format.

- **"Function" Plot**-You may plot results of a particular function (exceedance probability stage-discharge or damage-stage) shown in the table.

- **"Function" Report**-You may show results of a particular function in a tabular report format.

Help Menu

You may obtain help for data entry for all variables on the screen by clicking the HELP button. The F1 key may be used to get specific help on the data entry item where the cursor is located. The Contents, Search for Help On...., Using Help are Windows styled Help options for HEC-FDA.

Additional Program Concepts/Capabilities

Save, Add/Update, Cancel, and Close

You save new data/information to the database by pressing the **Add** or **Save Button**. The **Add Button** converts to the **Update Button** when returning to a screen where existing data are present. After editing existing data, the **Update Button** is pressed to save the information to the database. The **Cancel Button** cancels any changes made to the data and returns the screen to its original state. You close a screen by selecting **Close** under the **File** menu.

Navigator Button

The **Navigation Button**, (lower left corner of Figure 3.11) is available on several screens to allow quick movement through a data entry record list. Examples of data lists are streams, plans, and damage reaches.

The << symbol places you at the top (first) record of the list, while the >> symbol places you at the bottom (last record). The < (previous) symbol and the > (next) symbol move you back one record and forward one record in the list, respectively. The center of the navigation button indicates the number of records in the list and which record you are presently accessing. You create a new record (blank out data fields) by pressing on the center of the button.

Figure 3.11 Navigation Button

Assignments

Computations for expected and equivalent annual damage and project performance are performed using the exceedance probability, stage, and damage functions. They must be defined for each damage reach index location for each stream, plan, and analysis year. The definition specification is referred to an assignment in HEC-FDA. The capability to define (assign) functions and information to physical stream locations (Streams and Damage Reaches) and specific plans (Plans and Analysis Years) is an integral part of the program design. Assignment items are located at the top of the screen and separated from data entry and operations by a horizontal line. Other key data sets require similar assignments. You may review the assignments associated with specific functions under **View** in **HydEng** and **Economics**. An (*) indicates an assignment is made but that some required data are missing. An (****) indicates that no assignment has been made. A (+) means that the data are out-of-date, i.e., the data to generate a function or output report has been changed.

Often it is desirable to use the same function for several plans and or analysis years. For example, the without-project condition base year stage-discharge function for damage reach 1 may be used for Plans A and C for both the base year and most likely future year with- and without-project conditions. Table 3.1 lists the possible assignment items and associated Copy combinations permitted for multiple assignments. The program filters the copies as shown in the table.

Table 3.1
Permitted Functions/Features Copying for Different Assignments

HEC-FDA Function/Feature	Plan	Analysis Year	Stream	Damage Reach	Damage Category
Water Surface Profiles	Yes	Yes	No	N/A	N/A
Discharge (Stage)-Probability	Yes	Yes	No	Yes	N/A
Stage-Discharge	Yes	Yes	No	Yes	N/A
Damage-Stage	Yes	Yes	No	No	No
Levee	Yes	Yes	No	No	N/A

Unique functions are copied from one plan to another by the **Use Existing Function**. You may use (copy) the entire function assignments of one plan to another by selecting **Edit/Global Assignment Copy.** For example, you may wish to use the same exceedance probability functions, or ratings, or stage-damage for different plans that have several damage reaches. You may use the **Edit/Global Assignment Copy** to perform the assignment operations.

Non-Modality

A powerful capability of Windows programs is the ability to view and interact with multiple windows at a time. Version 1.0 of HEC-FDA is primarily non-modal, meaning many of the windows can be opened simultaneously. However, HEC-FDA Windows under **Study Configuration** (Streams, Damage Reaches, Plans, and Analysis Years) and **Damage Categories** and **Occupancy Types** under **Economics** are modal-only, i.e., only one window may be active or viewable at a time. This is due to the potential corruption of the data base if certain operations are performed for these screens when multiple windows are open.

Study Backup

You should keep a current backup of the study subdirectory containing the study data. The .sty file under the main directory should also be included. If for some reason your database becomes corrupted, you should delete the subdirectory and copy your backup to a new subdirectory of the same or different name.

On-line Help

On-line or Context Sensitive Help is available throughout the program. You may review help for data variables on a screen by pressing the help button. Specific **Help** at the cursor location may be obtained using F1. General program **Help** may be obtained by selecting **Help** located on the upper right of main menus.

Printing

You may choose to print lists of data entry information reports, assignments reports, and output reports, and plots. The program uses the Windows operating system printers and printer setup.

Warning Messages

Warning Messages are invoked throughout the program to assist with data entry and program operations. A log of warning messages associated with program execution is available and recommended for review under **Evaluation/Results/Damage by Analysis Year.**

Exiting Program

You exit the program from the **File** menu. The study data is then stored in a subdirectory under the study file name.